- As needed, a water truck and soil binder additive system would be employed to continuously wet site gravel roads, queues, stockpiles, and working faces (this practice has proved to be extremely effective at Hanford soil cleanup sites). A sprinkler system might also be used to control dusts.

- Excavation and truck loading activities would be discontinued when winds are excessive.

- The exposed working face of a borrow pit would be limited.

- Stockpile profiles would be minimized wherever possible.

- Haul roads and queues would be rocked.

- Conveyor systems would be fitted with misting systems to minimize fugitive dusts.

Area C was selected for use as a borrow pit because of its proximity to the 200 Area waste disposal facilities, and the borrow pit would be designed to minimize dust and safety hazards.

D.4 Liner Options for Disposal Facilities

Liners in disposal facilities can delay water entering into the vadose zone and eventually into ground water. However, liners have the potential to adversely affect long-term performance by retaining water within the disposal facility around the waste thereby leaching radioactive and hazardous components from the waste. Options for application of liners to waste disposal are described in this section.

Mixed waste disposal facilities are required by RCRA and State regulation to contain a liner underneath the waste, and LLW facilities may also use liners to retain any rain or snow water that has fallen onto the disposal facilities and contacted waste materials. This water, which is called leachate, may contain hazardous and radioactive materials that have been leached from the waste. The leachate must be contained, removed, and treated in facilities designed to meet applicable standards. These standards require that the liner function during the active operational period and for a minimum of 30 years after closure of the disposal facility. Landfill liners are typically constructed of one or more layers of earthen materials (e.g., sand, silt clay, gravel, or cobbles), plastics (e.g., High-Density Polyethylene [HDPE]), or a combination of these materials). The primary objective of a landfill liner is to prevent any leachate from percolating down into the underlying aquifer. The liners that have been used in the existing disposal trenches are described and illustrated in Section 2.2.3.5. Other liner options are described below:

- no liners
- regulatory-compliant liners
- clay liners
- other types of liners.

As discussed in Section 5.3, the normal soils and geologic media would retard migration of most radionuclides and chemicals. Even when liners are part of a disposal facility, no credit is taken for the liner in evaluating the long-term performance of disposal facilities. The EIS analysis assumes no liners for independent LLW disposal facilities, which has been the standard practice for the LLBGs at Hanford where the annual precipitation is low. To ensure that analyses are conservative when evaluating the potential releases from LLW disposal, even in lined facilities, no credit is taken for the liner. Due to long time period of analysis and the relative short expected life of liners (30-100 years) it was conservative to model transport to ground water as if the liner did not exist. Liners effectively minimize transport of contaminants from the disposal facility during operations. However, there is no scientific consensus regarding the lifetime of liners.

The mixed waste trenches, ERDF, and all of the lined disposal facilities evaluated in the HSW EIS alternatives are designed with liners that meet applicable technical standards. The liners are a combination of clay, drainable layers, and thick polymeric liners, as discussed in Section 2.2.3.5.

Some disposal facilities use only a clay liner with its natural ability to retard water flows. Smectite or bentonite-type clays are suitable for this function because they have very low permeability to water and are less subject to geologic modification with time than polymeric liners. However, they can be subject to shrinkage and cracking as the water environment changes.

Another option for minimizing contaminant migration could be the use of a permeable reactive barrier in-lieu of the traditional double-lined system. Disposal facility trench design could optimize the physical and chemical characteristics in a trench bottom in order to maximize artificially created attenuation of radionuclides and hazardous waste components. Disposal site design could optimize the soil adsorption capacity by artificially creating a permeable reactive barrier in the trench bottom by adding such materials as flyash, zeolite clays, various oxides, zero valence metals (e.g., metallic iron), granulated activated carbon, phosphates, lime, and peat. Manipulating trench-bottom material pH could also assist in enhancing specific contaminants' retardation. The type and amount of additives, method of additive installation (e.g., layered adsorbents vs. a homogenous blend of adsorbents), and physical/ chemical manipulations deployed to create an artificial reactive barrier would depend primarily on such factors as waste composition (types and volumes) and climate. Field and laboratory tests have demonstrated that flyash and zeolite clays alone greatly improve the retention of most radionuclides (except the actinides) and hazardous contaminants. Installing such a reactive permeable liner system under a mixed waste trench could provide a long-term solution to waste isolation as opposed to the uncertainty associated with long-term performance of landfill barriers, performance monitoring, and landfill liner systems. A permeable reactive barrier could be substantially lower in cost than a traditional double-lined system due to such factors as lower construction costs and elimination of the need to collect and treat leachate during the operating life cycle of the facility and would provide, with a high level of certainty, the ability to isolate waste for thousands of years.

D.5 Barrier Options

The modified RCRA Subtitle C Barrier was selected for use in this EIS as the reference design barrier for LLW and MLLW disposal facilities and is discussed in Section 2.2.3.6. A focused feasibility study (DOE 1996) was performed to examine engineered barrier options that have broad application and are considered viable from the standpoint of effectiveness, implementability, and cost. The feasibility study evaluated a total of four conceptual barrier designs for different types of waste sites. The Hanford